

**ADDITIONAL DATA ON THE BIOLOGY AND ECOLOGY OF STRIGODERMA ARBORICOLA FAB. (SCARABAEIDAE-COLEOPTERA).\***

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During the years 1932 to 1935, the writer made a number of observations on the biology and ecology of *Strigoderma arboricola* in Minnesota. All rearings were undertaken in 1932 and culminated early the following year. Mated pairs were isolated in four-ounce salve tins supplied with damp soil and a few rose blossoms for food. The soil was examined daily after oviposition began, and the eggs obtained were transferred to cavities in dampened soil within two-ounce salve boxes and covered with soil to conserve moisture. Following hatching, the grubs were placed in jelly glasses containing blue grass sod in which later transformations occurred. These containers were kept in a basement room which maintained a rather uniform temperature of 23° C.

*Habitat.*—According to the observations and literature cited by Hayes (1921), *S. arboricola* is recorded as having been captured on the flowers of the following plants: wild and cultivated roses, red clover, *Opuntia humifusa*, *Monarda punctata*, blackberry, water willow, *Dianthera americana* Linn., cactus, timothy, elderberry, dewberry, dog fennel, *Verbena stricta*, wild parsnip, *Plantago*, *Saponaria*, *Tephrosia*, and *Erigeron*. In Minnesota, I have taken adults on the flowers of both wild and cultivated roses, water lily, *Phleum pratense* L., *Achillea millefolium* L., *Amorpha canescens* Pursh., fireweed, and peony. When abundant, the adults of this species cause considerable damage to cultivated roses by destroying the buds and flowers through feeding activities. Large numbers of adults were also taken on wild rose blossoms, especially on those plants growing along roadsides. On June 25, 1932, 41 females and 34 males were taken on the blossoms of wild rose plants which were growing on one side of a sand dune blow-out. This collection was made about eleven o'clock in the morning, and the beetles were taken only on those plants exposed to the direct rays of the sun. The beetles also frequent bogs and feed extensively on the petals of water lily blossoms. As many as 18 adults were collected from a single blossom on June 28, 1932.

*Egg Stage.*—The eggs of *S. arboricola* when freshly laid are elongate-oval in shape and pearly-white in color. Measurements

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of six of these eggs averaged 1.49 mm. in length and .96 mm. in width. As development proceeds the eggs increase in size and assume a more globose form. Shortly before hatching the eggs became minutely alutaceous, cretaceous in color, and measure 1.88 mm. long and 1.52 mm. wide. The average duration of the egg stage for 36 eggs was 17 days, with extremes of 11 and 25 days. Hatching occurred the last part of July and the first part of August.

*Larval Stage.*—Hayes (1921) reared four larvae to maturity and found that the duration of the larval stage varied from 326 to 331 days. These grubs were fed bran until the second molt after which wheat grains were substituted. The three grubs I reared to maturity required from 160 to 164 days to complete their larval development on blue grass sod. Adult emergence occurred about the middle of January. This was a surprisingly early date inasmuch as the length of the developmental period of other scarabaeid larvae (*Trichiotinus* and *Pelidnota*) reared under the same laboratory conditions was accelerated only a few weeks in contradistinction to conditions in nature.

On September 15, 1932, a practically mature larva was collected beneath horse dung in a pasture near Anoka, Minnesota. This grub became an adult in January, paired with a laboratory reared male, and deposited fertile eggs. The above record, I believe, is the only recorded instance of a larva of this species being taken in nature. Whether this particular grub passed its early development in the manure or upon the roots of nearby vegetation can only be conjectured. Thus, the feeding habits of the larvae have not been determined under field conditions; therefore, the economic status of this stage is unknown.

*Prepupal and Pupal Stages.*—Shortly before prepupation, the larvae cease feeding and form elongate, slightly curved earthen cells, which are about 30 mm. long, 10 mm. wide, and 9 mm. deep. Within these cells, a prepupal period of approximately 6 days and a pupal period of about 13 days are passed. The pupae of *S. arboricola* vary from 9 to 12 mm. in length and from 4.5 to 6 mm. in width. Recently transformed pupae are light brown in color but they gradually darken as the adult colors are assumed.

*Adult Stage.*—In Minnesota, adults of this species were collected in Pope, Ramsey, Hennepin, and Anoka counties. Mating, which may be consummated in two minutes or require as long as 15 minutes, has been observed to take place on wild rose blossoms during the latter part of June. Following a preoviposition period of 11 days, fertile females deposited their eggs singly in the soil.

Fecundity records maintained for 14 females show that they deposited an average of 4.4 eggs (minimum 1, maximum, 14 eggs) during their life under laboratory conditions. The average span of life of 21 beetles kept under the same conditions was 18.8 days, with extremes of 11 and 31 days.

## LITERATURE CITED

Hayes, W. P. 1921. *Strigoderma arboricola* Fab.—its life cycle (Scarab. Coleop.). *Canadian Entomologist* 53(6): 121-124.

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**Cissia mitchelli in New Jersey.**—The Satyrid butterfly, *Cissia mitchelli* French, is recorded in the N. J. List of Insects, J. B. Smith, 1899, from Dover, N. J., in June, with the remark "it seems to be rare." This record appears again in the subsequent list issued in 1909, indicating C. W. Johnson as the collector and the statement "no other recent captures." Holland's Butterfly Books says it has been collected near Lake Hopatcong. All these records are based on the single capture by Johnson, approximately 40 years ago. The butterfly has not been turned up again in New Jersey, nor has it ever been recorded from New York State. What became of Johnson's specimen is not known. It has not been deposited in a museum collection.

This answers an inquiry by W. S. McAlpine, of Birmingham, Mich., regarding the status of *Cissia mitchelli* in New Jersey. Mr. McAlpine has been collecting this butterfly in Michigan. He has obtained eggs and is carrying over winter a number of the larvae. When Mr. McAlpine has completed his life history investigation, we hope to publish it in the BULLETIN.

The habitat of *Cissia mitchelli* in Michigan, according to Mr. McAlpine, is along very narrow grassy strips bordering small water courses in the midst of a dense tamarack swamp. This almost inaccessible haunt undoubtedly has had considerable bearing on the scarcity of the butterfly in collections. It has been collected also in Ohio. Any additional records would be appreciated by Mr. McAlpine.—GEO. P. ENGELHARDT, Hartsdale, N. Y.